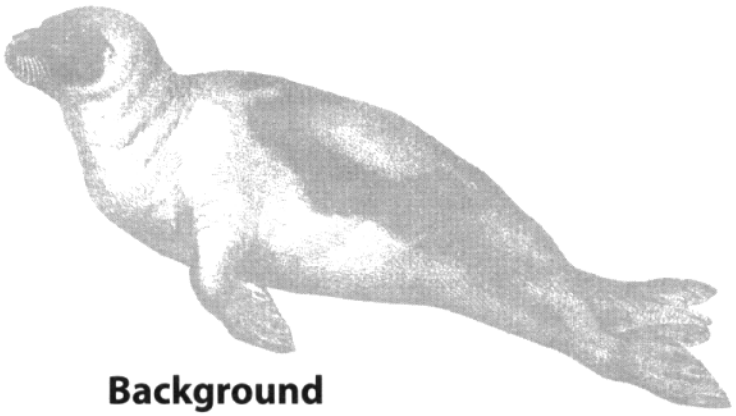
How Wet Is Our Planet?



Objectives

Students will: 1) describe the amount and distribution of water on the earth in oceans, rivers, lakes, groundwater, icecaps and the atmosphere; and 2) make inferences about the importance of responsible water use.

Method

Students calculate water volumes using percentages.

Materials

A large display map of the world; a 12-inch diameter globe (one showing the ocean bottom is best); a five or ten-gallon aquarium; bucket, trash can, or other container; writing materials; calculators; measuring cup; one-quart (or one liter) container for every three students; one measuring tablespoon (or one ml graduated eyedropper) for every three students

Grade Level: 5-8

Subject Areas: Math, Environmental Education, Social Studies

Duration: one 40- to 60-minute session

Group Size: any; individual and small group work

Setting: indoors

Conceptual Framework Topic Reference: AAIIA2

Key Terms: water cycle, freshwater, saltwater, groundwater, earth, planet

Appendices: Ecosystems, Metric Conversion

Background

The earth has been called the water planet. Between two-thirds and three-fourths of its surface is water. The earth's water can be seen in flowing rivers, ponds, lakes and oceans, locked in the northern and southern icecaps and drifting through the air as clouds. Water that has seeped into the earth's crust (groundwater) is more difficult to see, yet all these forms of water are part of the dynamic interrelated flow of the water cycle.

Water is continually moving around, through and above the earth as water vapor, liquid and ice. The same water is continually being recycled all around the earth.

Students tend to think of the water on the planet as being limitless and yet simple calculations demonstrate the fact that the amount of water is limited. Scientists believe that all the water that we will ever have is on the earth right now. Whatever amount is available to humans and wildlife depends largely on how its quality is maintained. Human beings have a responsibility to conserve water, use it wisely and protect its quality.

Procedure

NOTE: Refer to the table in the Variation section to adjust this activity for metric approximations.

1. Using a map of the earth, begin a discussion of the amount of water that covers the earth. Ask the students to comment on why the earth is called "the water planet." Call the students' attention to the statistic that

continued

between two-thirds and three-fourths of the surface is covered with water. After general discussion, provide the students with the following statistics:

Water on Earth

Source	Percent
Oceans:	97.2000
All icecaps/glaciers:	2.0000
Groundwater:	0.6200
Freshwater lakes:	0.0090
Inland seas/salt lakes:	0.0080
Atmosphere:	0.0010
All rivers:	0.0001
Total:	99.8381 percent

Source: The Cousteau Almanac, New York: Doubleday/Dolphin, 1981.

2. Discuss the relative percentages. Ask the students to calculate the estimated amounts of fresh water potentially available for human use:

Source	Percent
Groundwater:	0.6200
Freshwater lakes:	0.0090
Rivers:	0.0001
	0.6291
including icecaps/glaciers:	2.0000
	2.6291

3. In discussing these figures, emphasize that pollution and contamination reduce the usable percentage of existing fresh water. Also, all the groundwater is not available and icecaps certainly are not readily available. Discuss the needs of humans for usable fresh water. Ask the students to consider which other life forms need both fresh and saline (salt) water.

4. Now show the students five gallons of water in an aquarium. Provide the students with the following quantity: 5 gal = 1,280 Tbsp.

5. Have the students assume that the five gallons represent all the water on earth. Do the calculations for them, or ask the students to calculate the volume of all the other quantities on the water percentage list. This will require the use of decimals. Remind the students that for multiplication, all the decimal places must be shifted two places to the left so that 97.2% becomes 0.972 prior to multiplication (i.e., 0.972 x 1280 Tbsp = 1244.16 Tbsp). The following values result:

5 Gallons

Source	Tablespoons
1. Oceans:	1,244.1600
2. Icecaps/glaciers:	25.6000
3. Groundwater:	7.9360
4. Freshwater lakes:	0.1152
5. Inland seas/salt lakes:	0.1024
6. Atmosphere:	0.0128
7. All rivers:	0.0012
Total:	app. 1,280.0000

6. Once the values are obtained, ask the students to calculate the volume of the water other than ocean water (approximately 34 Tbsp). Ask them to divide up in teams of three and put 34 Tbsp of water in a container and take it to their workplaces.

7. Once the students are at their workplaces, ask them to remove the amount of water represented by all freshwater lakes and rivers (it is 0.111 Tbsp, approximately one-tenth of a tablespoon or 25 drops from a standard dropper). Then ask the students to extract the amount represented by rivers (it is one-thousandth of a tablespoon). This is less than a drop. Discuss the relative proportions with the students.

8. Consider the fragile nature of the freshwaters, wetlands and oceans of our planet. Discuss how all species depend upon this minute percentage of water for their survival. Summarize the activity by using a globe to illustrate that if Earth were this size (12 inches in diameter) less than one-half cup (eight tablespoons) of water would fill all the oceans, rivers, lakes and icecaps. Close by emphasizing the importance of keeping the earth's waters clean and healthy and to use water wisely and responsibly.

Variation

Do this activity using the metric system. Using the conversion factor of 1 gal = 3.8 l, then all of the water on Earth represented earlier by 5 gal would be equivalent to 19 l or 19,000 ml.

19 Liters

Source	Millimeters
1. Oceans:	18,468.000
2. Icecaps/glaciers:	380.000
3. Groundwater:	117.860
4. Freshwater lakes:	1.710
5. Inland seas/salt lakes:	1.520
6. Atmosphere:	0.190
7. All rivers:	0.019
Total:	app. 19,000.000

Extensions

1. Create a mural of the water cycle that graphically includes the statistics that represent the relative amount of water in each component of the cycle.
2. Calculate how much pollution is entering our waterways each year.
3. Calculate the size of a model of earth that would accommodate all the water in the aquarium used in the demonstration.
4. Which wildlife habitats require the most water?

Evaluation

1. Estimate the percentage of water that is distributed in each of the following areas of our planet: oceans, rivers, freshwater lakes, inland seas and saltwater lakes, groundwater, icecaps and glaciers and the atmosphere.
2. Explain why it is important that humans use water responsibly.

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